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Alfalfa Leafcutting Bee Newsletter: Volume II, No. III

TITLE: Chalcid Parasites, a Promising New Bee Safe Chemical and Grasshopper Baits.

It seems there are growers not aware of my responsibilities as a Department entomologist working with the alfalfa leafcutting bee and seed producers of Montana. I believe my most important function is to generate information which may help improve alfalfa seed and bee production through protection of pollinators and control of agricultural pests. This involves regulatory work. It also means that during the growing season I am available for on-site visitations to any alfalfa leafcutting beekeeper in the state who may have questions or concerns over specific situations involving "bees 'n seed" in general. I do not propose to know all the answers to proposed questions, but I do have access to information and can act as a "messenger" relating the experiences (i.e., chemical types and dosages, identification of insect pests, techniques used for chalkbrood disinfection, etc.) of one grower to another. If one has a bee kill or an exceptionally good return on bees, I may be able to offer insights as to why. I have not met with all beekeepers in the state, although I would like to. If you would like me to

come by your place during the growing season, please notify me. This is a big state which makes scheduling awkward, but visitations can be arranged.

CHALCID PARASITES

In reference to the first two sentences from a past newsletter dated July 11, 1985 (Vol I, No II) on page 2:

> 'On day 4 of incubation, vapona strips (no pest strips) may be placed at the rate of 1 per 1,000 cubic feet. These strips are generally not necessary if infestation levels of parasites are 3% or less.'

Please reconsider, if not totally disregard the second sentence of the above quote. This year, in one case, a grower averaging less than 2 percent chalcid parasitism (based on Helena certification results) lost a minimum of 60 percent of his live larvae to Canadian chalcid (Pteromalus venustus) parasitization prior to and possibly during field placement of the bees. Black lights over water were used and were assumed to be effective on the first generation of chalcids which began emergence on approximately day 11. By the end of the third week of incubation (day 23), a second generation of the wasps had emerged and proceeded to reparasitize the leafcutting bee population in a devastating manner.

After discussing the potential of Canadian chalcids to destroy leafcutting bees with Frank Parker at the U.S.D.A. bee lab in Logan, Utah and Harold Arnett at the University of Nevada at Reno, I now believe that vapona (no pest strip) should be used if chalcid parasites are detected at all, be it in the Helena lab analysis or if sighted in the incubator.

FACTS CONCERNING THE BIOLOGY OF THE CANADIAN CHALCID (PTEROMALUS VENUSTUS)

Pteromalus venustus is presently the most common wasp parasite associated with leafcutting bees in Montana. It was accidentally introduced to Canada and the Pacific Northwest from Europe with shipments of bees. Adult females are roughly 2.5 mm (one-tenth inch) long and males may average 12 mm (one-twelfth inch) long. Females are black with dark brown on the legs and males are similar but have a metallic green head. Females have a slender ovipositor (egg laying organ that looks like a "stinger") and enlarged hind legs. Adults emerge through a single hole not much larger in diameter than the wasp itself which is chewed through the bee cell. Males usually emerge before females.

Females of Pteromalus pierce the cocoons of their hosts with their ovipositors to paralyze the hosts and then lay eggs on the larval surface. The number of eggs layed on a bee larva surface may range from 40 to more than 100 but rarely will

more than 50 adults emerge from a single cell. An average of 30 adult Pteromalus per parasitized cell is not uncommon. Eggs hatch in 2 to 6 days, depending upon temperature, and the small, white hairless wasp larvae then attach themselves to the paralyzed bee and begin feeding. These larvae are about one-tenth inch long when mature. There is considerable mortality of eggs and larvae, partly because of cannibalism, but not of pupae. Larvae can either progress directly to the adult stage or remain as mature larvae and enter the overwintering state. Overwintering larvae require some cold treatment before progressing to the adult stage. Adult parasites generally emerge over a 4 day period starting on the 8th or 9th day of incubation. The wasp develops so rapidly at 85 degrees F, that if it is poorly controlled during the first emergence another emergence can occur before or just as the bees are taken to the field which results in another loss of unemerged bees. The male to female ratio may vary from 1:1 to 1:3. Unmated females produce only male offspring (Eves, J.D. et.al., 1980 and Richards, K.W., 1985).

CONTROL:

Ones best defense against chalcid parasites is against the first generation emergence in the incubator. This emergence may begin as early as day 7 of incubation and may extend to the

emergence of the first adult male bees which generally occurs on about day 14. At this point, (day 14) the no pest strip (used at the recommended dosage) should be removed and the incubator thoroughly aired out or ventilated with the doors open for at least 8 hours; 10 would be safer yet. These strips must be used with care because exposure for too lengthly of a time period may cause bee mortality. Also, vapors from most insecticide strips adhere readily to porous surfaces (i.e., wooden incubation trays) and as vapors are released, bee mortality may occur.

Vapona or no pest strips still appear to be the best means of chalcid control when used in combination with black lights suspended over soapy water. Many brands are available and the active ingredient should be dichlorvos (DDVP) which is the same as O,O-dimethyl-O-2, 2-dichlorovinyl phosphate. Please, if chalcid parasites are present in any number in loose cells, use the no pest strips as described in Newsletter No. II, dated June 11, 1984. Copies are available from the State Department of Agriculture in Helena.

- FLUVALINATE ? -

There is a chemical manufactured by the Zcecon Corporation, a division of the Sandoz Company based in Palo Alto, California with a brand name of "Spur" (RS,2R Fluvalinate) which was submitted to the EPA for registration for use on alfalfa seed

in November of last year. It sounds especially promising as an alternative to systox and dylox for aphid and lygus control. It also has potential for grasshopper control. It is presently registered in many states for use on non-bearing fruit and nut trees and vines and certain crops (i.e., cabbage, carrots, lettuce, onions, spinach, tobacco and others) grown for seed. It can be applied in the evening shortly after bee flight has subsided and will then be safe for bees left in the field. Hopefully, the material will be registered for alfalfa seed by next growing season. The material is proposed to be "easy" on beneficial insects such as damsel bugs, big eyed bugs and lady beetles.

GRASSHOPPERS

There are approximately 100 grasshopper species in Montana, but not more than one half dozen of these are responsible for the bulk of damage to range and crop plants. These pest types overwinter as eggs and generally the bulk of egg hatching occurs from mid-May to mid-June. From egg hatch to the adult or winged form will take 35 to 60 days, depending upon the weather. Weather also affects the number of eggs layed during late summer and early fall. A cool summer and an early fall may delay maturity of grasshoppers, thus shortening the egg laying period and reducing populations the following year. Eggs are placed from one to two inches deep in the soil. They are encased

in a pod which helps protect them from unfavorable weather and some predation. Females may lay from 200 to 400 eggs in pods, with 25 to 100 eggs per pod. Generally, grasshoppers "select" sites to deposit eggs that ensure a high rate of young grasshopper survival the following spring. Normally, these areas are around the root zone of grasses and on land that is not disturbed from year to year (i.e., alfalfa fields). Egg development begins in the fall and is stopped by winter weather. In the spring, when soil temperatures reach 60 degrees F., eggs will again begin to develop and hatching occurs in 5 to 25 days (Gillespie and Wight, 1985).

One should begin to look for grasshoppers in alfalfa seed fields as early as mid-May. If, prior to the second week of June, hopper populations have reached 20 per square yard, then an insecticide application may be justified, especially if plant damage becomes evident.

CONTROL:

There were a number of seed fields in the central and eastern areas of the state this spring in which grasshoppers were controlled with chemical prior to bee flight. These were immature stages which seemed to hatch in and around seed fields. The grasshoppers then seemed under control (in most cases) until large immatures and adults migrated in from outside areas. In some cases border treatments with relatively long acting insecticides combined with baits in and around fields seemed

effective. A major problem with border treatments is that winged adults can simply fly over them in large numbers, into the field. In these situations baits seem the safest possibilities for grasshopper control which also allows protection for bees and beneficials. However, sometimes, (especially in dry land situations), by the time adult hoppers migrate in, bloom and bees have diminished to a point where a chemical treatment may be considered. It becomes obvious that grasshoppers can be an especially aggravating problem in alfalfa seed. Registered materials that are fairly safe to pollinators and beneficial insects in alfalfa seed are presently limited to poison baits and spore baits, all of which have been poorly tested for this particular crop. Which material is better in a given situation and how effective the control will be over a given time period seems open to much debate since data on relative effectiveness of commercial baits and different formulations seems non existent at this point in time. Baits, available commercially in Montana consist of those listed in Table 1, at the end of this paper.

One thing to keep in mind when using grasshopper baits is that these insects generally do not take free water. A moisture balance is therefore necessary in their diet. Dry baits seem more effective in lush vegetation and moist baits seem more effective in dry vegetation.

INFORMATION ON NOSEMA SPORES:

The spores are sold with a "sticking agent", generally in 50 acre packages. The buyer supplies the bran, water and a spray gun for applying the spore to the bran. Nosema seems most effective when applied to 3rd instar (maybe 5/8 inch long) grasshoppers in the spring. The disease organism competes for fat stores in the body of the grasshopper and is specific to only certain grasshopper species. When grasshoppers molt or shed their skin (5 or 6 times) there is a 3 day interval in which they cannot eat and during this time susceptible grasshoppers will die from malnutrition. Spores are spread by grasshopper cannibalism, wind, rain and to a limited degree, by eggs. A percentage of spores can overwinter and remain viable the following spring.

REFERENCES USED:

Eves, J.D., et.al., 1980. Parasites, Predators and Nest Destroyers of the Alfalfa Leafcutting Bee, Megachile rotundata. Western Regional Extension Publication No. 32: 4-5.

Gillespie, B. and R. Wight, 1985. Crop and Rangeland Grasshopper Management Guide. Montana State Agriculture Department Tech. Bull. 85-2: 1-12.

Richards, K.W., 1985. Alfalfa Leafcutter Bee Management in Western Canada. Publication 1495E, Lethbridge, Alberta: 42-43.

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Use of trade names does not imply endorsement of one product over another.

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Attachment 1

Table 1. 1985 List of Commercially Available Baits Registered for Alfalfa in Montana

	BRAND NAME	COMPANY	ACTIVE INGREDIENT	AMT/ACRE	GENERAL INFORMATION
1.	Sevin Brand 20% Bait	Union Carbide	20% Carbaryl (Sevin)	7.5 lbs/ acre	This is a dry, bran, bait.
2.	Sevin Brand 10% Bait	Union Carbide	10% Carbaryl (Sevin)	15 lbs/ acre	Same material as #1 with twice the concentration of poison.
3.	Sevin 5 Pellets	Wilbur Ellis	5% Carbaryl (Sevin)	30 lbs/ acre	An apple pumice pellet with a molasses or banana oil attractant.
4.	DeBug Ag	Sidwell Enterprises; Parker, Colorado	2% Carbaryl (Sevin)	1.5 to 3.0 lbs/acre	A dry, bran bait.
5.	Hopper Halt	Colorado Insectory; Durango, Colorado	Nosema locustae (1 billion spores/gram 0.1%)	1.5 to 2.0 lbs/acre	This is a disease causing agent (spore) incorporated onto a bran bait.
6.	Grasshopper Attack	Reuter Laboratories, Gainesville, VA	Nosema locustae (2.9 billion spores/gram 0.29%)	1 to 2 lbs/ acre	A disease causing agent (spore) incorporated on a bran bait.